

# PROCEEDINGS

## AMERICAN SOCIETY OF CIVIL ENGINEERS

NOVEMBER, 1954



### STATE ACTIVITIES AND FISCAL ASPECTS

Report of a Subcommittee of the Committee on  
Refuse Collection and Disposal of the  
Sanitary Engineering Division

### SANITARY ENGINEERING DIVISION

*{Discussion open until March 1, 1955}*

Copyright 1954 by the AMERICAN SOCIETY OF CIVIL ENGINEERS  
Printed in the United States of America

Headquarters of the Society  
33 W. 39th St.  
New York 18, N. Y.

PRICE \$0.50 PER COPY

## THIS PAPER

--represents an effort by the Society to deliver technical data direct from the author to the reader with the greatest possible speed. To this end, it has had none of the usual editing required in more formal publication procedures.

Readers are invited to submit discussion applying to current papers. For this paper the final date on which a discussion should reach the Manager of Technical Publications appears on the front cover.

Those who are planning papers or discussions for "Proceedings" will expedite Division and Committee action measurably by first studying "Publication Procedure for Technical Papers" (Proceedings - Separate No. 290). For free copies of this Separate—describing style, content, and format—address the Manager, Technical Publications, ASCE.

Reprints from this publication may be made on condition that the full title of paper, name of author, page reference (or paper number), and date of publication by the Society are given.

The Society is not responsible for any statement made or opinion expressed in its publications.

This paper was published at 1745 S. State Street, Ann Arbor, Mich., by the American Society of Civil Engineers. Editorial and General Offices are at 33 West Thirty-ninth Street, New York 18, N. Y.

**STATE ACTIVITIES FISCAL ASPECTS: Report of a Subcommittee of the  
Committee on Refuse Collection and Disposal of the  
Sanitary Engineering Division**

This report on State Activities and Fiscal Aspects is one of a series produced by Subcommittees of the Sanitary Engineering Division's Committee on Refuse Collection and Disposal. Other committees have reported on Collection; Dumping and Landfill; Hog Feeding; Incineration; Reduction and Other Methods of Disposal. These reports are being published as separates as they are edited. While not consecutively issued or numbered, the reports will form a series representing the final report of the Committee on Refuse Collection and Disposal.

The committee consisted of:

Henry W. Taylor, Chairman

Norman W. Nester

Charles L. Senn

Newell L. Nussbaumer

V. M. Ehlers

Sol Pincus

Charles L. McGauhey

Members of the Subcommittee concerned are listed at the end of this and the other Subcommittee reports.

## FOREWORD

In 1901, M. N. Baker made the following and now classic statement:

"In no branch of municipal service has so little progress been made in the United States as in the disposal of garbage. Why do such conditions exist? First, because the sanitary collection and disposal is appreciated neither by the general public nor the city officials; second, because it is seldom recognized that the problems incident to final disposal are largely engineering in character and therefore should be entrusted to engineers."

Mr. Baker's statement could be enlarged in scope by substituting "refuse" for "garbage" and adding emphasis to the need for engineering technique and administration in collection as well as in disposal methods.

Activities of the Committee on Refuse Collection and Disposal since its inception may be briefly summarized as follows:

In 1935 the Sanitary Engineering Division appointed a "Committee on Technical Aspects of Refuse Disposal" and this Committee functioned until January, 1942, during which period four reports were submitted and abstracted in Civil Engineering. The final report of this Committee stated that:

"due to the unusual activity of members of the Committee and on account of the lack of general interest in the subject under consideration at this time, together with a feeling on the part of the Committee Members that the subject is not particularly well adapted to Committee action, it is recommended that this Committee be discontinued."

The "unusual activity" of Members of the Committee still exists. Any lack of general interest in this subject has been replaced by the pressing necessity of solving a municipal problem which places increasing demands on public officials and engineers. A new Committee was appointed in 1947 and a progress report was submitted by the Chairman, Rolph Eliassen. This progress report outlined many of the facets of this subject and the need for application of engineering technique and administration.

At the 1949 meeting of this Society, a report was submitted by the Committee on "Advancement of Sanitary Engineering," which recommended the collaboration of the personnel from other technical organizations in the activities of Committees working on projects of broad scope. The recommendation met with quick approval and the present Committee has attempted to put these recommendations into tangible form by introducing Subcommittees who operate as task groups under the leadership of the personnel of the base Committee.

A report by the Committee in January 1950 confined itself to the organization of the Committee and Subcommittees with a prospectus of objectives. A Progress Report was submitted in October 1952 and included the efforts of seven Subcommittees.

This report for 1953 may be considered as the final report of the Committee with the objectives originally stated by this Committee. The increased activity in research, in design and operation are leading to an extensive program of literature emanating from individuals, colleges, institutions and commissions and any attempt by this Committee to include all this data would be futile and a subsequent report would be largely a bibliography of this literature. In other words, present activities have extended beyond the scope of the Committee and involve a volume of current literature from various sources which are available from their original source.

This report is actually individual reports of the seven task groups acting as Subcommittees. The Chairman has considered that each group contains acknowledged experts within the scope allotted to it and has not, in general, modified or condensed the reports as submitted by these separate Subcommittees. He has also considered that it would be impracticable for the base committee as a whole to attempt to pass on or modify the work of the individual groups since the scope of these groups includes such a varied field.

The Chairman has reduced the personnel of various Subcommittees, as stated in this report, to those who have been able to devote time and submit data to their various Subcommittee Chairman. The Chairman wishes to express his appreciation of the cooperation of the Committee and Subcommittee Members.

HENRY W. TAYLOR, Chairman  
A.S.C.E. Committee on  
Refuse Collection and Disposal

## INTRODUCTION

The Chairman of the Committee requested Mr. V. M. Ehlers in 1952 to head a Subcommittee which would prepare a report reflecting "State Activities" in the matter of refuse collection and disposal. It was considered that this aspect of the matter would be of value to the Committee report and in spite of the short time available for the work delegated to Mr. Ehlers, he and his Subcommittee were able to quickly gather data and tabulate a compressive survey of State Activities. In 1953, the Chairman also requested that this Committee take over the "Fiscal Aspects" of refuse collection and disposal.

The report of this Subcommittee is divided in two disassociated parts, namely:

### State Activities Financial Aspects

The Chairman of the Committee could see no benefit to be derived from the printing of extensive tabulation prepared from questionnaires, sent out by this Subcommittee and only summary tables are included herein. Furthermore, the Chairman has conferred with Mr. Ehlers with reference to the report submitted in 1953 and as a result of this discussion, this final report has undergone revision from the mimeographed report submitted to the American Society of Civil Engineers in September 1953.

### State Activities

In the absence of proper facilities for collection and disposal of garbage, public nuisances are created and potential health hazards have been allowed to exist in many of our populated areas where these services have not been provided. The maintenance of good sanitation practices, resulting in a clean, wholesome environment is a proper function of the community. Unfortunately some communities have not assumed this responsibility, and individuals must handle alone their garbage collection and disposal problem. Without an organized plan, complaints have resulted concerning types of containers used, waste accumulation on private premises or adjacent to highways, fly breeding and many others, quite a few of which filtered to local and State Health Departments.

Uncontrolled dump grounds have emitted foul odors, caused smoke complaints, created rat harborage, mosquito breeding places and fly breeding media, and even, in some instances, storm drainage from such garbage disposal areas has polluted streams and threatened the safety of sources of water supply. An effective fly and rodent control program in a community cannot be realized unless there is proper storage, collection and disposal of garbage and other organic wastes. In the absence of state-wide public works departments or any other state-wide agency specifically charged with garbage collection and disposal practices, the complaining public sought consulting advice from health departments and, in many instances, requested their offices to relieve them of nuisances caused by garbage. These requests prompted State Health Departments to provide consulting advice and to carry on activities in this field to some degree.

Since garbage decomposes more quickly and fly breeding is more of a

problem in the South, quite a number of State Health Departments in the southern states have found it expedient to initiate insect and rodent control programs, both of which involve proper collection and disposal of wastes in populated areas. In some instances where the State Health Department recommended the construction of incinerators or sanitary landfills, these works after being constructed were not entirely satisfactory, due to faulty construction and improper operation, and, as a consequence prompted some State Health Departments to undertake the approval of plans for such units before construction. Some of the State Health Departments also sponsored the training programs for operators of the facilities to secure more efficient operation. The construction and demonstration of suitability of sanitary landfills, especially in the smaller communities, has met with popular approval, based on our observations here in Texas. Again it has been illustrated that an educational and promotional program sponsored by a State Health Department has created considerable interest by local officials and has brought about great progress in this field. This Subcommittee issued questionnaires to all State Departments of Health and from these questionnaires prepared three summary tabulations.

Since the tabulation was prepared, reports have been received from Wisconsin and Maryland. The data submitted by Wisconsin is as follows:

Submission of Plans:	Incineration plants only.
State Supervision:	Inspections.
Contemplated Plans:	None
Types of Disposal:	5% incinerators, 2% sanitary landfills, 17% hog farms, 76% dumps.

Schools on Disposal:	Sanitary landfill short course scheduled for this year.
----------------------	---

Symposiums or educational meetings:	Yes. Two-day seminars once or twice per year in various areas of the state.
-------------------------------------	---

By Maryland as follows:

Submission of Plans:	Yes. Must be approved by the State Board of Health.
State Supervision:	Inspections and recommendations.
Contemplated Plans:	None.
Types of Disposal:	75% open, 12% hog farms, 8% sanitary landfills, 5% incinerators, 1% garbage grinding with discharge sewers.

Schools on Disposal:	No
Symposiums or educational meetings:	Considered feasible.

#### Schools of Disposal

Except for the following, no schools for disposal exist.

#### Exceptions:

- Arizona - "In conjunction with fly control schools"
- Arkansas - "Conferences with City Officials"
- California - "None now, under consideration however"
- Colorado - "Training programs"
- Connecticut - "Under Consideration"
- Illinois - "Used in training personnel"
- Maine - "Educational talks"
- Missouri - "A portion of inservice training"
- Nebraska - "No schools conducted, Educational talks given"

# TABULATION OF STATE ACTIVITIES

STATE TERRITORY DISTRICT	SUBMISSION OF PLANS	STATE SUPERVISION	TYPES OF DISPOSAL
Alaska	No	Inspections and recom- mendations	almost 100% dumping 75% in tidal waters, 25% on land
Arizona	No	By request only	1 Incinerator only 10% landfill 90% open dump
Arkansas	No	Consultation Service	20% Trench & fill 80% open dump
California	No	None. Handled through Local Health Depts.	85% to 90% Open dumps Approx. 12 Incinerators, and Approx. 20 to 30 high quality landfill installa- tions.
Colorado	No	Consultation and recommenda- tions.	15 Space fills for refuse only 3 Space fills combined 1 Trench fill, combined collection, part time 1 Space fill, refuse only, part time
Connecticut	Plans Required for Incinerators	Occasional Inspections	7 towns Incinerators 17 towns Hog Feeding 9 towns dumping 2 towns modified landfill
Columbia	Approval of Na- tional Capital Park and planning com- mission is required on plants, disposal installation & other pertinent items	Advisory	9.4% Incineration 34.7% Landfill-Open controlled burning 46.7% landfill-non combustible 9.1% Hog feed- ing .1% Garbage Grinder
Florida	Plans Required for Incinerators	Consultation Service	
Georgia	No	Consultation Service	Chiefly Sanitary landfill. Percentages not available
Hawaii	No	If structural unit, plans are reviewed by health dept. under local building codes	35% Incineration 65% Open dumps
Idaho	No	Advisory only	3 Sanitary landfills the rest open dumps

TABULATION OF STATE ACTIVITIES

STATE TERRITORY DISTRICT	SUBMISSION OF PLANS	STATE SUPERVISION	TYPES OF DISPOSAL
Illinois	No	Advisory only	10 Incinerators 7 Sanitary landfills
Indiana	No	Surveys and recommendations	30% dumps with trash and garbage 50% dumps for trash but garbage fed to hogs 5% incineration 15% Sanitary landfills
Iowa	No	Advisory Service	Garbage 55% open dumps and combina- tion of landfill and dump and hog feeding and dump 26% hog feeding 17% Sani- itary landfill 1% Incinera- tion Refuse 59% Dumps 9% Sanitary landfill 1% Incineration
Kansas	No	Only on a re- quest and com- plaint basis	90% use either open dump or a combination of open dump and hog feeding.
Kentucky	Yes	Through County Health Depts.	No information
Louisiana	Requires submis- sion of plans for garbage or waste destruction plants	Inspections	56% Incinerators 29% Land- fills 25% dumps
Maine	No	Consultation Service	5% Incinerators 95% Dump- ing
Massachusetts	No	Consultation Service	3% Incinerators 1% Sani- itary Landfills 96% open dumps Garbage generally fed to hogs
Michigan	No	Only on com- plaint or re- quest	66% Hog feeding or combin- ation of feeding with dumping and burial 25% open dumping 3% burial 3% Incineration 2% Grind- ing 1% other
Minnesota	Yes	Inspection & recommendations	10 Sanitary landfills 12 hog feeding 7 incinera- tors 106 dumps
Mississippi	No	Advisory only	Mostly Open Dumps Sanitary landfill progressing fav- orably

TABULATION OF STATE ACTIVITIES

STATE TERRITORY DISTRICT	SUBMISSION OF PLANS	STATE SUPERVISION	TYPE OF DISPOSAL
Missouri	No	Advisory Service	59% Swine Feeding (Raw) (Garbage) 65% Sanitary Land- fill (Refuse) 35% Refuse Dumps 39% Central Garbage Grinding 2% Sanitary Land- fill
Montana	No	Consulting basis only	99% Open dumps 1% Sanitary landfills
Nebraska	No	Consultation Service	5 Sanitary landfills 505 Open Dumps
Nevada	No	Inspections & Consultations	40% Garbage Dump 60% Poor Sanitary landfill
New Hampshire	No	From a nuisance angle only	
New Mexico	No	Consultation Service	10% Sanitary landfills 15% Modified landfills 75% Open Dump
New York	No	Consultation Service	40% Incineration 30% Hog Feeding 20% Dumping 10% Miscellaneous
N. Carolina	No	Consultations	Open dumping predominates. Have several incinerators.
N. Dakota	Plans not re- quired	Consultation Basis	97% Open Dump 3% Sanitary & modified landfills
Ohio	No	Surveys & Recom- mendations	24% Incineration 23% Sani- itary landfills 11% Open Dumps 42% Hog Farms (gar- bage) plus dumps (all other refuse)
Oklahoma	No	Consultations & Recommendations	Not more than 1% use land- fills less than 1% incin- erators and the rest open dumps
Oregon	No		Majority of the Communi- ties Open dumps Few Sani- itary landfills Few Incin- erators
Pennsylvania	No	None	60% Sanitary landfills 15% Incineration 25% Undeter- mined

# TABLETATION OF STATE ACTIVITIES

STATE TERRITORY DISTRICT	SUBMISSION OF PLANS	STATE SUPERVISION	TYPES OF DISPOSAL
Rhode Island	No	Surveys & recommendations	3 Incinerators others dumps and hog feeding
S. Carolina	Plans must be submitted for incinerators	Consultation & Advice	75% garbage dumps 10% sani- itary landfill 15% incinera- tors
S. Dakota	No	On	4 landfills, 153 open dump, 15 hog & chicken feeding
Tennessee	No law but do request plans be submitted for re- view & comment	Advisory Service	83.5% Open dump 15% Sani- itary landfills 1% incin- eration 0.5% hog feeding
Texas	No	Consultation Service	1.95% Incineration 13.63% Sanitary landfills 3.90% Modified landfill 70.17% Dump 10.39% Miscellaneous
Utah	No		90% Open Dumps
Virginia	No	Survey, inspect submit sugges- tions and recom- mendations	10 Sanitary landfills 14 Incinerators 29 Open dumps
Washington	No	Advisory & con- sultation	2% Incinerators 15% Sani- itary landfills 73% Modified landfills 10% Open dumps
West Virginia	Under law they can require submission of plans but have not due to lack of personnel	Consultation	
Wyoming	No	Promotional only	98% Open dumps 2% Sanitary landfill

## NOTES

The only states contemplating plans for the future relating to additional state activity are:

Florida - "Full Time Sanitary Engineer"

South Dakota - "Through district office"

Texas - "Yes, contemplate additional office personnel"

New Hampshire - "First school to be held this fall"  
 New York - "Lectures and Demonstrations"  
 Pennsylvania - "Yes, Sanitary landfill demonstrations"  
 Rhode Island - "Conduct refuse control school"  
 Texas - "Yes, 27 held. Contemplate starting again possibly this fall"  
 Virginia - "School for Sanitarians in progress"  
 West Virginia - "Have had 3"

#### Symposiums or Educational Meetings

Only five states answered "No", without comment, under this heading. Others report Symposiums as "Feasible", "Under Consideration", or referred to some agency which was carrying on the work.

The information gained by the Task Committee indicates that, in general, those reporting did not have available comprehensive data on the subject of garbage disposal practices so as to enable the expression of an overall status of the problem. Only a few of those reporting gave specific information, and in several of these instances the degree of State supervision was not clearly indicated. "Consultation or advisory service" covers such a broad field of activities that the extent of field inspections and surveys is not known.

In considering all reports received, it appears that very few of the States have held special schools on disposal or demonstrations of sanitary landfill operations, but that most of those reporting felt that such educational programs would be feasible and worth while.

The overall appraisal of the data collected, however, reveals that open dumping is the most popular practice, but that there is a definite trend to installation of sanitary landfills or modified landfills. Feeding of garbage to hogs is practiced in Connecticut, the District of Columbia, Indiana, Iowa, Kansas, Massachusetts, Michigan, Minnesota, Missouri, New York, Ohio, Rhode Island, and South Dakota. Incineration is the principal method of disposal in Louisiana and New York. In Ohio, Virginia and Minnesota, it appears that incineration and sanitary landfill are considered with equal interest by municipalities.

Since it is not common practice to prepare plans for sanitary landfill operations, it is thought that technical supervision in the field is more important in securing desired results. Only nine (9) of the forty-five (45) reporting, indicated that plans for disposal facilities were reviewed, as required by State statutes or by request.

The several research projects on flies as carriers of disease have focussed that attention of health authorities on fly control and garbage dumps, the principal source of fly breeding in communities.

Mr. Paul W. Purdom, Sanitary Engineer, with the Communicable Disease Center of the Public Health Service, has called our attention to the article, "Municipal Fly Control by Environmental Sanitation" which appeared in MODERN SANITATION, Volume 3, No. 8, August 1951. He also quoted from Dr. G. H. Crowell's statement in the May issue of THE NEW HAMPSHIRE HEALTH NEWS, as follows:

"Upon reviewing the nuisance complaints received by this Department over a period of years, we find that well over fifty per cent of them relate directly to public and private methods of garbage and refuse disposal."

Biological studies conducted by C.D.C. on prevalent domestic flies at Phoenix, Arizona, and Charleston, West Virginia, which will appear in the next Annual Report are quoted as follows:

"At Phoenix, data showed that garbage was superior to cow, human and rabbit excrement, grass, melon and stock feed, in fly production capacity. The average amount of garbage required to produce one adult house fly was 0.3 cc. as compared with volumes of 1.1 to 2.2 cc. for other substrates. A cubic foot of infested garbage was estimated to produce 70,000 adult flies. . . . .

Analyses of larval survey data for Charleston, West Virginia, and Phoenix, Arizona, reveal that . . . At Charleston, overwintering studies revealed the continuous breeding of M. domestica through the winter period in garbage stored in basements and indoor passages at food handling establishments. . .

Results from Phoenix, Arizona (1951), indicate that the major portion of house fly dispersion occurs within one mile of the release point. . . In Charleston, West Virginia, tests revealed Phormia regina, the black blow fly, to disperse rapidly throughout the city up to 10.5 miles. . . . .

The disposal of wet garbage on an open dump within flight range of the inhabited portions of the city is contrary to accepted methods of fly sanitation. Even the burning of combustibles on an open dump does not provide a significant degree of control, but serves only as a weak deterrent to fly breeding. Similarly, in the feeding of garbage to hogs, it is a practical impossibility to conduct such an operation without heavy fly infestations. Plans for elimination of both of these disposal practices should be prepared as a primary step in undertaking a community fly control program. . . . .

Fly dispersal tests were conducted using laboratory-reared flies of a yellow-eyed mutant strain of the common blow fly Callitroga macellaria. The tests indicated that this species of fly would move readily from the city dump back into the city proper . . . Results of the fly release test and surveys of fly breeding sources indicated that this city garbage dump, located approximately 3 miles from the heart of the business district, was the principal source of flies in the city."

As further studies are made on hog feeding and open garbage dumps, it is anticipated that the field of garbage collection and final disposal will receive greater consideration on the part of health authorities in the future.

Following the assignment of a Senior Engineer's Assistant to the project in Texas some four years ago, considerable improvement has been shown not only in collection services, but also in the maintenance and operation of disposal facilities. The services rendered were well received by city planners and local health authorities.

Due to the financial limitations of the smaller population cities, less expensive equipment for initiating the sanitary landfill method will need to be developed by the manufacturers before such a plan will be acceptable in the smaller communities. In some localities the procurement of land suitable for fill operations is becoming more difficult within reasonable hauling distances due to the trend of industry to move to the fringe areas.

Several communications received by the Committee recommended that composting of garbage be further explored. Over a half-million garbage grinders are in use in the United States in over 350 communities, according to Morris M. Cohn, while the District of Columbia maintains a garbage grinder capable of disposing of 10 tons of garbage per hour, and this method of disposal needs further study.

The above tabulations and notes have been based on a survey of the various states in 1952. The Subcommittee feels that the progress in garbage collection

and disposal methods have been very slow and additional research is indicated. Since collecting the data for the 1952 report a considerable change has occurred in the status of state supervision and, as of July, 1953, it may be said:

- 1) Twenty-four States maintain a program of approving construction plans for disposal plants.
- 2) Forty-two States have a program of investigation of local collection practices and inspection of garbage disposal facilities.
- 3) Thirty-nine States have a promotional program of improvement in all refuse practices.
- 4) Forty-two States maintain advisory services to Municipalities on their garbage collection and disposal problems.

In the above statement additional states are included as active in the first three items as against those listed in the Progress Report of 1952. This increase does not represent a total increase of activity in the year 1952-1953 because of delay in program review information available in 1952.

In the Progress Report of 1952, it was stated that eight states and territories had regulations pertaining to the feeding of garbage to swine. At the present time the total number of states having legislation and/or regulations pertaining to the control of feeding garbage to swine has grown to thirty-seven. In all cases, authority for carrying out the intent of this legislation was vested in the respective State Agricultural Agencies. The Territory of Alaska also adopted rules and regulations; however, in this case, authority for carrying out the provisions of the regulations was given the Territorial Health Department.

In regard to research, a report by the North Dakota State Department of Health and the Indiana State Department of Health and the Public Health Service are now available and are entitled "The Sanitary Landfill in Northern States," and "Community-Wide Installation of Household Garbage-Grinders."

The University of California has continued to conduct studies in the field of refuse collection and disposal in California and recently they have published their Technical Bulletin #8 entitled "An Analysis of Refuse Collection and Sanitary Landfill Disposal." A special report on composting conducted at the University of California has also been published.

We have noted however, a summary of this report by Gotass and Card entitled "Composting Organic Refuse from Municipalities" which appeared in the March 1953 issue of Western City Magazine. In addition, it is our understanding that Michigan State College at East Lansing, Michigan, is initiating composting studies. Iowa State College has applied for and received a Public Health Service grant for the purpose of studying time-temperature relationships with respect to the survival of trichinae and other pathogenic organisms in garbage being heat-treated for swine feed.

The Public Health Service has initiated an inventory of refuse collection and disposal practices to be conducted by the State Departments of Health on a voluntary basis. The response from these departments has been most gratifying and complete inventory forms from approximately 1300 municipalities are surveyed. The assembly and tabulation of this data is not now available.

In view of the studies which have been made and the results of the surveys conducted, this Committee feels that State Departments of Health are warranted and encouraged to undertake the following activity, if funds and personnel are made available for this purpose and local conditions warrant such action, in an attempt to raise the standards of garbage and refuse collection and disposal:

- 1) Conduct educational programs to promote adequate and proper garbage

and refuse collection services and disposal facilities to serve populated areas. This educational program might include the preparation of bulletins which contain information helpful to community officials in the initiation of such projects, such as recommended minimum facilities for collection, transportation and disposal of garbage and refuse from cities of varying population, estimated costs involved, suggested ordinances, etc.

- 2) Offer consultation services to acquaint individuals and groups as to the public health aspects of such projects, and to assist them in the development of plans. After plans have been developed, they might also be reviewed to be assured that the public health aspects have been given favorable consideration.
- 3) Train personnel in charge of disposal facilities, especially concerning those phases of operation which would have public health significance.
- 4) Initiate research projects which might result in the development of more economical and practical methods of handling the garbage and refuse problems.
- 5) Encourage the development of suitable garbage disposal facilities by the governmental agency closest to the scene having personnel, funds and facilities for rendering such service.
- 6) Make necessary field surveys and render such supervision as possible to improve existing conditions.

#### Financial Aspects

The information thus far gained from this survey regarding the financing of garbage collection and disposal seem to indicate a fair system of maintaining records of cost.

The overall cost per capita on collection and disposal seems to be about the same in all four areas, which can be noted in the attached tabulation and geographic spotting.

In certain instances there seems to be a wide margin of budgetary allowances. As an example the City of Austin, Texas, with a population of 132,459 is provided with \$374,504.00 for collection and disposal services, while the City of Mobile, Alabama, with a comparable population, received \$172,923.00. The frequency of collection services may be the crucial element making this wide difference and then too, the manner of disposal may be another factor to consider.

Private collection services do not seem to be a popular means of operating a garbage program since only 13 of approximately 49 cities employ this method.

The average percentage of the total budget allocated to refuse collection and disposal for the cities reporting is 5%. A similar average percentage of the Public Works Budget is 28%.

The accompanying map indicates the outline of areas I to IV into which the United States has been divided together with the names of cities reporting. The following tabulation gives an analysis of costs for these different areas.

	Average Cost Disposal per capita	Average Cost Collection per capita	Average percent City budget per capita	Average percent Public Works budget per capita
*Area I	\$0.44	\$2.30	2.7%	21%
*Area II	.45	3.01	6.3%	37%
*Area III	.42	2.71	4.6%	39%
*Area IV	.40	3.15	5.3%	27%

A table has been prepared indicating the funds which supply the costs of refuse collection and disposal in the case of various reporting cities.

	No. Cities Reporting	General Fund	Special Tax Levy	Service Charge	Both General Fund & Service Charge	General Fund & Incinerator Fees	Other
Methods of Financing Refuse Programs	66	44	4	9	7	1	1

From the questionnaire the following information was obtained with reference to collection agencies.

	No. Cities Reporting	Municipal	Private	Both
Collection Agency	63	49	13	1

The average costs per capita and the median costs per capita for the reporting cities is as follows:

	Disposal	Collection
Average Costs per capita	.43	2.73
Median Cost per capita	.37	2.62

A tabulation was prepared to indicate average costs of collection and disposal together with the average percentage of cities and public works budgets when cities of various populations were grouped together.

Average Cost of Disposal Per Capita Per Annum	Average Cost of Collection Per Capita Per Annum	Average % of City Budget Used for Ref- use Handling Per Annum	Average % of P.W. Budget Used for Ref- use Handling Per Annum
--	--	---	---

**POPULATION  
GROUP OF  
CITIES, IN  
1,000's**

Under 60	.37	2.41	5.1	24
60 to 100	.37	3.54	5.9	31.4
100 to 150	.36	3.09	6.2	33.1
150 to 300	.42*	2.78	4.6	33.4
300 and over	.38	2.90	3.6	22.6

\*The City of Miami, Florida was excluded since it was felt that their per capita cost for disposal was excessive when compared with the cost in cities of comparable size.

Respectfully Submitted,  
V. M. Ehlers, Chairman

E. C. Nelson  
Le Roy W. Van Kleeck  
F. H. Waring

Earl Devendorf  
Harold Gotaas  
Ralph J. Derwerker



# PROCEEDINGS-SEPARATES

The technical papers published in the past year are presented below. Technical-division sponsorship is indicated by an abbreviation at the end of each Separate Number, the symbols referring to: Air Transport (AT), City Planning (CP), Construction (CO), Engineering Mechanics (EM), Highway (HW), Hydraulics (HY), Irrigation and Drainage (IR), Power (PO), Sanitary Engineering (SA), Soil Mechanics and Foundations (SM), Structural (ST), Surveying and Mapping (SU), and Waterways (WW) divisions. For titles and order coupons, refer to the appropriate issue of "Civil Engineering" or write for a cumulative price list.

## VOLUME 79 (1953)

NOVEMBER: 321(ST), 322(ST), 323(SM), 324(SM), 325(SM), 326(SM), 327(SM), 328(SM), 329(HW), 330(EM)<sup>a</sup>, 331(EM)<sup>a</sup>, 332(EM)<sup>a</sup>, 333(EM)<sup>c</sup>, 334(EM), 335(SA), 336(SA), 337(SA), 338(SA), 339(SA), 340(SA), 341(SA), 342(CO), 343(ST), 344(ST), 345(ST), 346(IR), 347(IR), 348(CO), 349(ST), 350(HW), 351(HW), 352(SA), 353(SU), 354(HY), 355(PO), 356(CO), 357(HW), 358(HY).

DECEMBER: 359(AT), 360(SM), 361(HY), 362(HY), 363(SM), 364(HY), 365(HY), 366(HY), 367(SU)<sup>c</sup>, 368(WW)<sup>c</sup>, 369(IR), 370(AT)<sup>c</sup>, 371(SM)<sup>c</sup>, 372(CO)<sup>c</sup>, 373(ST)<sup>c</sup>, 374(EM)<sup>c</sup>, 375(EM), 376(EM), 377(SA)<sup>c</sup>, 378(PO)<sup>c</sup>.

## VOLUME 80 (1954)

JANUARY: 379(SM)<sup>c</sup>, 380(HY), 381(HY), 382(HY), 383(HY), 384(HY)<sup>c</sup>, 385(SM), 386(SM), 387(EM), 388(SA), 389(SU)<sup>c</sup>, 390(HY), 391(IR)<sup>c</sup>, 392(SA), 393(SU), 394(AT), 395(SA)<sup>c</sup>, 396(EM)<sup>c</sup>, 397(ST)<sup>c</sup>.

FEBRUARY: 398(IR)<sup>d</sup>, 399(SA)<sup>d</sup>, 400(CO)<sup>d</sup>, 401(SM)<sup>c</sup>, 402(AT)<sup>d</sup>, 403(AT)<sup>d</sup>, 404(IR)<sup>d</sup>, 405(PO)<sup>d</sup>, 406(AT)<sup>d</sup>, 407(SU)<sup>d</sup>, 408(SU)<sup>d</sup>, 409(WW)<sup>d</sup>, 410(AT)<sup>d</sup>, 411(SA)<sup>d</sup>, 412(PO)<sup>d</sup>, 413(HY)<sup>d</sup>.

MARCH: 414(WW)<sup>d</sup>, 415(SU)<sup>d</sup>, 416(SM)<sup>d</sup>, 417(SM)<sup>d</sup>, 418(AT)<sup>d</sup>, 419(SA)<sup>d</sup>, 420(SA)<sup>d</sup>, 421(AT)<sup>d</sup>, 422(SA)<sup>d</sup>, 423(CP)<sup>d</sup>, 424(AT)<sup>d</sup>, 425(SM)<sup>d</sup>, 426(IR)<sup>d</sup>, 427(WW)<sup>d</sup>.

APRIL: 428(HY)<sup>c</sup>, 429(EM)<sup>c</sup>, 430(ST), 431(HY), 432(HY), 433(TY), 434(ST).

MAY: 435(SM), 436(CP)<sup>c</sup>, 437(HY)<sup>c</sup>, 438(HY), 439(HY), 440(ET), 441(ST), 442(SA), 443(SA).

JUNE: 444(SM)<sup>e</sup>, 445(SM)<sup>e</sup>, 446(ST)<sup>e</sup>, 447(ST)<sup>e</sup>, 448(ST)<sup>e</sup>, 449(ST)<sup>e</sup>, 450(ST)<sup>e</sup>, 451(ST)<sup>e</sup>, 452(SA)<sup>e</sup>, 453(SA)<sup>e</sup>, 454(SA)<sup>e</sup>, 455(SA)<sup>e</sup>, 456(SM)<sup>e</sup>.

JULY: 457(AT), 458(AT), 459(AT)<sup>c</sup>, 460(IR), 461(IR), 462(IR), 463(IR)<sup>c</sup>, 464(PO), 465(PO)<sup>c</sup>.

AUGUST: 466(HY), 467(HY), 468(ST), 469(S.), 470(ST), 471(SA), 472(SA), 473(SA), 474(SA), 475(SM), 476(SM), 477(SM), 478(SM)<sup>c</sup>, 479(HY)<sup>c</sup>, 480(ST)<sup>c</sup>, 481(SA)<sup>c</sup>, 482(HY), 483(HY).

SEPTEMBER: 484(ST), 485(ST), 486(ST), 487(CP)<sup>c</sup>, 488(ST)<sup>c</sup>, 489(HY), 490(HY), 491(HY)<sup>c</sup>, 492(SA), 493(SA), 494(SA), 495(SA), 496(SA), 497(SA), 498(SA), 499(HW), 500(HW), 501(HW)<sup>c</sup>, 502(WW), 503(WW), 504(WW)<sup>c</sup>, 505(CO), 506(CO)<sup>c</sup>, 507(CP), 508(CP), 509(CP), 510(CP), 511(CP).

OCTOBER: 512(SM), 513(SM), 514(SM), 515(SM), 516(SM), 517(PO), 518(SM)<sup>c</sup>, 519(IR), 520(IR), 521(IR), 522(IR)<sup>c</sup>, 523(AT)<sup>c</sup>, 524(SU), 525(SU)<sup>c</sup>, 526(EM), 527(EM), 528(EM), 529(EM), 530(EM)<sup>c</sup>, 531(EM), 532(EM)<sup>c</sup>, 533(PO).

NOVEMBER: 534(HY), 535(HY), 536(HY), 537(HY), 538(HY)<sup>c</sup>, 539(ST), 540(ST), 541(ST), 542(ST), 543(ST), 544(ST), 545(SA), 546(SA), 547(SA), 548(SM), 549(SM), 550(SM), 551(SM), 552(SA), 553(SM)<sup>c</sup>, 554(SA), 555(SA), 556(SA), 557(SA).

a. Presented at the New York (N.Y.) Convention of the Society in October, 1953.

c. Discussion of several papers, grouped by Divisions.

d. Presented at the Atlanta (Ga.) Convention of the Society in February, 1954.

e. Presented at the Atlantic City (N.J.) Convention in June, 1954.

# AMERICAN SOCIETY OF CIVIL ENGINEERS

## OFFICERS FOR 1955

### PRESIDENT

WILLIAM ROY GLIDDEN

### VICE-PRESIDENTS

*Term expires October, 1955:*

ENOCH R. NEEDLES

MASON G. LOCKWOOD

*Term expires October, 1956:*

FRANK L. WEAVER

LOUIS R. HOWSON

### DIRECTORS

*Term expires October, 1955:*

CHARLES B. MOLINEAUX

MERCEL J. SHELTON

A. A. K. BOOTH

CARL G. PAULSEN

LLOYD D. KNAPP

GLENN W. HOLCOMB

FRANCIS M. DAWSON

*Term expires October, 1956:*

WILLIAM S. LaLONDE, JR.

OLIVER W. HARTWELL

THOMAS C. SHEDD

SAMUEL B. MORRIS

ERNEST W. CARLTON

RAYMOND F. DAWSON

*Term expires October, 1957:*

JEWELL M. GARRELTS

FREDERICK H. PAULSON

GEORGE S. RICHARDSON

DON M. CORBETT

GRAHAM P. WILLOUGHBY

LAWRENCE A. ELSENER

### PAST-PRESIDENTS

*Members of the Board*

WALTER L. HUBER

DANIEL V. TERRELL

---

### EXECUTIVE SECRETARY

WILLIAM N. CAREY

### ASSISTANT SECRETARY

E. L. CHANDLER

### TREASURER

CHARLES E. TROUT

### ASSISTANT TREASURER

GEORGE W. BURPEE

---

## PROCEEDINGS OF THE SOCIETY

### HAROLD T. LARSEN

*Manager of Technical Publications*

DEFOREST A. MATTESON, JR.

*Editor of Technical Publications*

PAUL A. PARISI

*Assoc. Editor of Technical Publications*

---

### COMMITTEE ON PUBLICATIONS

SAMUEL B. MORRIS, *Chairman*

JEWELL M. GARRELTS, *Vice-Chairman*

GLENN W. HOLCOMB

OLIVER W. HARTWELL

ERNEST W. CARLTON

DON M. CORBETT